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ABSTRACT

Although computerized instruction has been used in various educational areas for years, agricultural educators only recently started to consider its use in secondary vocational agricultural programs. Of the three roles possible for computerized instruction (CI)--tutor, tool, and tutee--only the tool role can be implemented profitably in agricultural education at present. CI can be used in its tool role because the software available for vocational agriculture is oriented toward use in agricultural industry. These programs are tools for record keeping or management decision making. The use of agricultural industrial software increases students' computer literacy and their ability to use similar programs upon employment. Computer tools reduce computational time needed for problem solving, leaving students free to focus upon subject problems rather than concentrating on mathematics computations. Implementation of CI faces problems in the areas of hardware systems, teacher training and attitudes, and software quality. Solutions to the hardware problems will come from the computer industry, but teacher training programs must prepare teachers to use all forms of CI in their teaching and overcome prevalent negative attitudes. In addition, teachers must be involved in preparing software for classroom use because computer programers are not attuned to instructional processes. Solving these three problems will be the next step for successful integration of computerized instruction into secondary vocational agricultural programs. (KC)

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The Role of Computers in Vocational Agriculture Instruction

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The computer age with its rapidly changing technology has affected all areas of life. Computers are being used extensively in agriculture, government, business and other areas of society for information processing and problem solving. All aspects of education, including agricultural education, have become concerned with educational uses for computers. Questions are being raised about the usefulness of computerized instruction, its role within the curriculum, and its capabilities to enhance learning.

Although studies of computerized instruction in education began in 1960 (Hallworth and Brebner, 1980), agricultural educators only recently started to consider its use in secondary vocational agriculture programs. Some agriculture teachers are using computers for record keeping, but the broader uses of computerized instruction have largely been ignored.

Computerized instruction (CI) refers to uses of the computer for instruction of individuals or groups of students. These uses include five software (program) categories: experiential, informational, reinforcement, integrating, and tools (Thomas, Note 1). Experiential programs use discovery methods; they set the stage for further learning. Informational programs present information to the student and then test the student's understanding of that information. Reinforcement programs are a series of exercises for student completion. Integrating programs

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allow students to apply previous knowledge and experience with new knowledge to solve a problem. Most computer simulations are examples of integrating programs. Tool programs facilitate and speed up previously learned processes. They permit students to tackle complex, realistic problems by minimizing the need to focus on mathematical computations.

Statement of the Problem

If computerized instruction is to become a viable tool for vocational agriculture programs, agricultural educators must determine what role computerized instruction should have in secondary vocational agriculture education programs. This paper considers the potential role for and the problems associated with CI in secondary vocational agriculture programs.

Role of CI in Secondary Vocational Agriculture Programs

Taylor (1980) identified three potential roles for computer usage in education: tutor, tool, and tutee. In the tutor role, the computer presents subject matter, and the student responds. The computer evaluates the response and then selects the next item for presentation based upon the response. Informational and reinforcement programs use a computer as a tutor. The tutor courses in basic math, reading, and writing skills for all elementary students attending the Los Nietos School of Los Angeles are examples of the computer in the tutor role (Hallworth and Brebner, 1980). Students benefit from these tutor courses because the computer adjusts instruction to fit each individual student's needs.

The computer as a tool works as an instructional aid. Computer programs form one part of the teaching unit along with other instructional methods. Integrating programs, experiential programs, and tool programs work well when the computer is used as a tool. These programs allow illustrations of concepts normally beyond the scope of the classroom.

The third role, the computer as tutee, requires students to teach the computer. The student tutoring the computer must learn to program or talk to the computer in a language which it understands. Using the computer as tutee, the student must develop an understanding of the subject in order to teach it. Also, by trying to incorporate broad educational goals into the narrower capabilities of computer logic, the student gains a better understanding of how a computer works as well as how his or her own thinking process works (Taylor, 1980).

In identifying the role of computerized instruction for vocational agriculture, three major factors must be considered. These factors are: (1) the availability of hardware, (2) the software currently available, and (3) appropriate methods for incorporating computers into the present vocational agriculture curriculum. Consideration of the three computer roles in relation to the current status of these three factors causes the authors to believe the primary role of computerized instruction should be as a teaching tool (tool role) for secondary vocational agriculture education programs. However, as the status of these factors change, the role of CI should also change and expand.

Presently, most public schools have fewer than five microcomputers

for their computerized instruction needs (Chambers and Bork, 1980). Microcomputers do not possess sufficient capacity for administration of comprehensive tutor programs. Effective classroom use of the computer in the tutor and tutee roles requires one computer for each student in a class; however, computers used as instructional tools can be used with small groups or even an entire class (Hallworth and Brebner, 1980).

The software available for vocational agriculture is oriented toward use in agriculture industry. These programs are tools for record keeping or management decision making (Gille, 1982). Very little, quality tutor software is applicable to vocational agriculture. The use of agricultural industry software increases students' computer literacy and their ability to use similar programs upon employment. Computer tools reduce computational time needed for problem solving. Thus, students are able to focus upon subject problems rather than concentrating on math computations (Thomas, Note 1). In agriculture, some record keeping programs will automatically compute efficiency factors based on production data. Class dicussion can be centered on means of increasing efficiency rather than the math needed to derive such factors. Also, decreased computations allow students to change input variables and explore cause and effect relationships in agricultural production systems. Management decision-making programs are often based upon system models using advanced math beyond average high school level abilities. Since the computer completes the needed computations, students can concentrate upon the concepts used in building the models.

For computerized instruction to be successful in vocational

agriculture, it should be usable without causing major modifications to the current curriculum and structure of secondary vocational agriculture programs. Instructional tools can be used like other forms of teaching aids. Teachers are accustomed to using overhead transparencies, 16 mm films, slide sets, worksheets, and other types of instructional aids in their lesson plans. Tool programs could be incorporated as one of several possible student activities, especially when they are used with small groups or the whole class for decision making. For these reasons, using the computer as a tool for instruction is appropriate at the present time.

An expanded role for CI could be considered as changes occur. If microcomputers are available for individual student use, all three computer roles could be used to some degree. Students could keep their supervised occupational experience records on microcomputers or investigate special interest areas using advanced simulations. Advanced students could program the computer to produce tutor type programs based upon their previous vocational agriculture instruction. Students needing remedial work would then use the tutor programs to improve their knowledge and skills. In the future, the computer could function as a tool, tutor, and tutee in secondary vocational agriculture programs.

Problems in Implementing CI in Secondary Vocational Agriculture Programs

Implementation of computerized instruction faces problems in the areas of hardware systems, teacher training and attitudes, and software quality. These problems are not unique to agricultural education; all areas of education face similar problems. Solutions to the problems

related to hardware will come from the computer industry. But, solutions for teacher and software problems should originate from within the educational community.

The present hardware systems use stand-alone microcomputers designed to serve one user at a time. Industry is now working to configure microcomputers for time share systems (Thomas, Note 1). Using a time share system, one microcomputer directs and manages five "dumb" terminals or any number of download terminals. Such systems would expand the computer capabilities and incorporate systems for managing tutorial instruction. Industry expects such systems to be available by 1985 (Hallworth and Brebner, 1980).

Teacher training programs must prepare teachers to use all forms of CI in their teaching and overcome prevalent negative attitudes. Among some teachers "...there is considerable awe of computers which is allied with fear and suspicion...they are perceived as threatening... and encroaching upon jobs as a preliminary to taking them over" (Hallworth and Brebner, 1980, p. 179). This fear is unfounded as computers without teachers are of little value. The instructor is the primary component for success in any CI system (Hallworth and Brebner, 1980). Using CI methods in preservice methods courses and providing inservice demonstrations are two methods that are effective for helping teachers. Once teachers get involved in CI, they become enthusiastic (Loop and Christensen, 1980). Interest and enthusaism are contagious, and the horizontal spread of CI in schools is a common phenomenon. Once the negative attitude barrier is broken, teachers have little trouble

finding ways to use CI in all areas of instruction (Jokels, 1980).

Solutions to software problems will require major efforts by educators. Software is incompatible between brands of hardware systems, and well-designed software is difficult to obtain. Software designed for an Apple computer will not work on a TRS 80 system and vice versa. Nor will mainframe software work on a microcomputer. Only the MECC system of Minnesota has attempted large-scale efforts to convert other systems' software for use on Apple computers (Jokels, 1980).

Quality software for educational uses is difficult to find. Without quality software "...microcomputers will be purchased by schools, and shortly, relegated to a cupboard most of the time" (Hallworth and Brebner, 1980, p. 115). Agriculture has some quality tool programs, but appropriate software for experiential, informational, reinforcement, and integrating instructional uses is rare. A variety of quality software is needed to improve CI in vocational agriculture. Quality software should meet standards in these areas:

1. Content - Content of the software must relate to the instructional curriculum of the agricultural program.
2. Cognitive development - The program builds upon previous student knowledge to guide the student in the formation of new knowledge.
3. Pedagogy - The process of learning must be enhanced by the interactive environment created by the program.
4. Technology - Software should be adaptable to meet the evolving capabilities of hardware.

5. Software design - The design should make use of the computer's complete capabilities whenever possible. The printed page fed into a computer is poor design (Olds, 1980).

These five standards give direction in developing software for instructional uses in vocational agriculture. But, the standards will not be worthwhile unless knowledgeable individuals such as teachers supervise the design of the software. Often, computer programmers do not understand educational processes well enough to formulate quality educational software.

Teacher training and software development are several years behind the hardware designs. Software forms the heart and brains of CI programs. Without the software, the computer is merely a glorified calculator, not worth its extra expense. Solving the aforementioned problems will be the next step for successful integration of computerized instruction into secondary vocational agriculture programs.

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